Remarks

Claims 1-70 are pending in the application. Claims 1-34 are allowed. Claims 35-70 are rejected. The drawings are objected to. The specification is objected to. The drawings and specification are amended herein. No new matter is added.

The Drawings are objected to. A drawing amendment is submitted herewith to overcome the objection to Figure 7. The specification is amended to overcome the objections to Figures 7, 8, and 13.

The specification is objected to. Paragraphs [0267] and [0340] are amended to overcome the Examiner's objections.

Claims 35-70 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 35-70 of copending U.S. Patent Application serial number 10/802,598. A terminal disclaimer is submitted herewith to overcome the provisional rejection.

It is noted that claim 37 is only provisionally rejected under 35 U.S.C. 101. There is no prior art rejection for claim 37, and the Applicants understand that claim 37 is allowable if the 35 U.S.C. 101 is overcome.

Claims 35, 45, 47-48, 53 and 56-60 are rejected under 35 U.S.C. 102(b) as being anticipated by Frisken et al ("Adaptively Sampled Distance Fields: A General Representation of Shape for Computer Graphics" SIGGRAPH 2000).

Composite glyphs are glyphs that are made up of elements. As a simple example, the letter 'T' includes a horizontal element [—] atop and centered over a vertical element [|]. The composition of the two elements produces the 'T' glyph. This is known in the art as a composite glyph. Traditional composite glyph rendering methods take one of two approaches. A first type of method renders the overlapping elements in a particular order, and either overwrite or blend pixels in an overlapping region of the composite glyph. A second method converts the elements making up the composite glyph into a single object and renders the single object. Where distance fields have been used to represent elements of a composite glyph, the distance fields have always been combined into a single distance field representing the object prior to rendering. The invention is different from the prior art.

Claim 35 recites a method for rendering a region of a composite glyph. A composite glyph is defined by a set of elements. A set of two-dimensional distance fields is generated using the set of elements, a composition of the set of two-dimensional distance fields representing the composite glyph. A region of the composite glyph is rendered using the set of two-dimensional distance fields. There is nothing in the prior art that describes generating a set of two-dimensional distance fields using the elements of a composite glyph and rendering a region of the composite glyph using the set of two-dimensional distance fields.

According to the invention, a composite glyph is defined by a set of elements. The Examiner points to Figures 4a-d in Frisken as disclosing the

set of elements defining the composite glyph. However, Figure 4a is a single object, i.e. an "$\mathcal{R}$." There are no elements defining the object. Figures 4b-d are illustrations of representations of the single object. The object has no set of elements. There is only one object and one quadtree (4b), distance field (4c) and ADF (4d) representing the object. Frisken does not describe composite glyphs anywhere. There is no composition of a set of elements shown. The different sized squares in Figures 4b-d are representative illustrations of cells of a single quadtree, single distance field, and single adaptively sampled distance field representing the object. There is no set of elements defining a glyph as claimed. Therefore, Frisken can never anticipate what is claimed.

In claim 45, a particular element in the set of elements is a distance field. In claim 47, a particular element in the set of elements is an adaptively sampled distance field. In claim 48, a particular element in the set of elements is a procedure. As stated above, Frisken never describes elements in a set of elements defining a composite glyph as claimed. Frisken can never anticipate what is claimed.

In claim 53, the defining is performed automatically by a procedure. In claim 56, the defining further comprises determining a shape descriptor for a particular element in the set of elements and determining a distance function for the shape descriptor to define the particular element. In claim 57, the defining determines the set of elements from a distance field of a shape descriptor for the composite glyph. Frisken describes representing a single object with a single distance field. Claimed is defining a composite glyph by a set of elements. Frisken does not anticipate what is claimed.

In claim 58, a particular two-dimensional distance field in the set of two-dimensional distance fields is an adaptively sampled distance field. In claim 59, a particular two-dimensional distance field in the set of two-dimensional distance fields comprises a set of distances stored in a memory. In claim 60, a particular two-dimensional distance field in the set of two-dimensional distance fields is represented by a procedure. Frisken describes representing a single object with a single distance field. Claimed is defining a composite glyph by a set of elements and generating a set of two-dimensional distance fields using the set of elements. Frisken does not anticipate what is claimed.

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al ("Adaptively Sampled Distance Fields: A General Representation of Shape for Computer Graphics" SIGGRAPH 2000) in view of Russ ("The Image Processing Handbook, Fourth Edition").

Russ operates entirely on images. Russ describes a Euclidean Distance Maps (EDM) as "a tool that works on a binary image to produce a grey-scale image." Page 427, lines 6-7. An EDM approximates, for each pixel in a discrete image, a distance from the pixel to the nearest background pixel of a binary image. Russ takes a binary image as input. The output is a grey-scale image that is a rendering of the EDM. Russ assigns a brightness to a pixel based on the pixel's distance to a nearest background pixel, see page 427, lines 6-11. Russ determines distances between pixels in an image.

Russ, at lines 26-30, does not describe a mapping from distance derived from a two-dimensional distance field to intensity. There, Russ describes

determining and representing the distances of an EDM from a binary image to produce a grey-scale image.

In claim 36, the rendering determines, for each component of each pixel in the region, an antialiased intensity of the component of the pixel from the distance fields representing the components. Frisken is silent as to antialiasing. Russ derives distances directly from pixels in images. There is no antialiasing described in Russ. It appears that the Examiner has confused generating EDM according to Russ, with a determining and antialiased intensity of the component of the pixel, as claimed.

Claims 38-44 and 50-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al ("Adaptively Sampled Distance Fields: A General Representation of Shape for Computer Graphics" SIGGRAPH 2000) in view of Applicant's specification.

In claims 38-44 and 50-51, a particular element in the set of elements is a stroke, an outline, a radical, a stroked radical, a two-dimensional shape descriptor, a one-dimensional shape descriptor, a path, an implicit blend of a first shape descriptor and a second shape descriptor, or a skeletal descriptor with a corresponding offset descriptor, respectively.

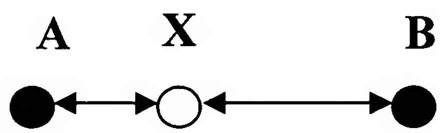
The Examiner is reminded that none of the references describes rendering a composite glyph using a set of two-dimensional distance fields, each representing an element in a set of elements defining the composite glyph. Russ and Kimmel are entirely inapplicable. Frisken teaches generating a single ADF representing an object. Perry always combines distance fields

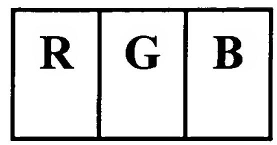
into a single distance field prior to rendering. The invention determines an antialiased intensity of a component of a pixel from the set of two-dimensional distance fields. The applicants own specification clearly distinguishes the blending, ordering, and distance field combining from what is claimed.

Claims 46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al ("Adaptively Sampled Distance Fields: A General Representation of Shape for Computer Graphics" SIGGRAPH 2000) in view of Kimmel et al (U.S. Patent Application publication number 2002/0097912).

Kimmel describes EDMs having "sub-pixel" accuracy. The Examiner confuses sub-pixel accuracy with a pixel component as claimed. The sub-pixel accuracy in Kimmel is obtained by interpolation. Interpolation is typically done, as in Kimmel, when the pixels in one image have a different resolution, i.e., the spacing between the pixels, than the pixels in another image. Kimmel describes a linear interpolation. For example, in the left figure below, the intensity of pixel X is determine from pixel A and pixel B. According to Kimmel the intensity of pixel X can be determined from the linear distance between A-X, and X-B. It should be noted the distances are measured at the center of the pixels in Kimmel. Measuring at the center of a pixel specifically precludes considering pixel components, as claimed. The figure on the right shows a pixel with three (RGB) color components according to the invention. Those of ordinary skill in the art would not confuse interpolation between pixels as in Kimmel with pixel components as claimed. Sub-pixel accuracy and multiple resolutions have to do with the

inter-pixel spacing and geometry. Pixel components have to do with the **intra-pixel** physical structure of a pixel.





"Sub-pixel accuracy" does not mean that Kimmel computes distances for each sub-component of a pixel. Kimmel states ***explicitly*** that distances are computed at pixel centers. Kimmel intensities are determined from discrete pixel images, which can never make the invention obvious. The invention operates on continuous distance values of a distance field. The Examiner has confused sub-pixel accuracy, which means that the EDM distances are propagated from distances at boundary pixels that were computed from the boundary of the object to sub-pixel accuracy, with pixel components. A pixel component is a physical element, e.g., a portion of red, green, or blue phosphor, or a red, green, or blue LCD that produces red, green or blue light. Pixel components have physical locations in a display device. Pixel components have nothing to do with the geometry of inter-pixel spacing that is determined by interpolation as in Kimmel.

Kimmel describes constructing an EDM that has sub-pixel accuracy and sub-pixel precision. Unlike the methods for computing EDMs described in Russ, which compute distances from pixels to a binary object representation where accuracy is limited to the pixel resolution of the binary object representation, Kimmel computes distances from boundary pixels to a

boundary of an object to sub-pixel accuracy. According to Kimmel, boundary pixels are pixels within a limited distance from the boundary of the object, i.e., less than the diagonal length of a pixel from the boundary of the object. Distances outside of that boundary region are computed by propagating the sub-pixel accurate distances using a method similar to level set methods and to Euclidean Distance Transform methods.

Further, the propagated distances of Kimmel are different from true Euclidean distances to the boundary of the object and hence Kimmel's EDM is different from a distance field which means that Kimmel cannot be combined with Frisken.

In claim 46, a particular element in the set of elements is a distance map. In claim 49, a particular element in the set of elements is a distance function. Here again, none of the references describes rendering a composite glyph using a set of two-dimensional distance fields, each representing an element in a set of elements defining the composite glyph. Frisken describes a single object represented by a single ADF. Kimmel describes sub-pixel accuracy and multiple resolutions related to **inter-pixel** spacing and geometry. Pixel components have to do with the **intra-pixel** physical structure of a pixel. Kimmel is irrelevant.

Claims 52, 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al ("Adaptively Sampled Distance Fields: A General Representation of Shape for Computer Graphics" SIGGRAPH 2000) in view of Perry et al ("Kizamu: A System for Sculpting Digital Characters").

Perry describes a system for sculpting digital character represented by ADFs. In section 7.1, Perry describes a method for generating a single three-dimensional distance field by combining triangle models generated from multiple range images of a single object. Distances from a sample point to each range surface generated by the range images are combined to generate a "closed, water-tight triangle surface from the signed distance volume." Perry always combines distance fields into a single distance field prior to rendering.

In claim 52, a particular element in the set of elements is drawn by a user. In claim 54, the defining is performed by a user. In claim 55, the defining is performed semi-automatically by a procedure and a user.

As stated above, Frisken teaches generating a single ADF representing an object. Perry always combines distance fields into a single distance field prior to rendering. The invention renders a region of the composite glyph using the set of two-dimensional distance fields. The combination of Perry and Frisken can never make the invention obvious.

It is believed that this application is now in condition for allowance. A notice to this effect is respectfully requested. Should further questions arise concerning this application, the Examiner is invited to call Applicant's attorney at the number listed below.

Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 50-0749.

Respectfully submitted,
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